REMARKS

Reconsideration of the application as amended is respectfully requested.

Status of Claims

Claims 1-7 are pending in the application, with claim 1 and 6 being the only independent claims. Claims 1-7 have been amended.

Overview of the Office Action

Claims 1-7 stand rejected under 35 U.S.C. §112, second paragraph, because (a) the term "substrate" has been used for both the semi-transmitting mirror-possessing substrate and the glass substrate; and (b) the thickness of the foundation film has been expressed in a range that includes 0.

Claims 1-7 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,686,985 (Tanaka).

Claims 1-7 stand rejected under 35 U.S.C. §103(a) as unpatentable over Tanaka in view of U.S. Patent No. 5,157,470 (Matsuzaki).

Amendments Addressing Section 112 Issues and Informalities

Claims 1-7 have been amended so that the expression "substrate" is now used to refer to the glass substrate only. In accordance with the Examiner's suggestion, the semi-transmitting mirror-possessing substrate is now referred to by the expression "substrate assembly".

In addition, in accordance with the Examiner's suggestion, the thickness of the foundation film is now expressed in a range of "greater than 0 to 8 nm".

In view of these modifications, withdrawal of the rejection of claims 1-7 under §112, second paragraph, is respectfully requested.

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The present application relates to a semi-transmitting mirror-possessing substrate assembly 1 that has both high transmissivity and high reflectivity. A semi-transmitting type liquid crystal display apparatus containing such a substrate assembly is also disclosed. See paragraph [0001] of the published specification.

The semi-transmitting mirror-possessing substrate assembly 1 comprises (a) a glass substrate 2; (b) a foundation film 3 formed directly on the glass substrate 2; and (c) a semi-transmitting reflective film 4 formed on the foundation film 3.

The foundation film 3, the semi-transmitting reflective film 4 and a protective film 5 constitute a semi-transmitting mirror 6. See Fig. 1; paragraph [0025] of the published specification.

The foundation film 3 prevents diffusion of an alkali leaching out from the inside of the glass substrate 2 and improves adhesion between the glass substrate 2 and the semi-transmitting reflective film 4. Paragraph [0028] of the published specification.

In the present application, the thickness of the foundation film 3 is in a range of greater than 0 to 8 nm. This particular thickness range improves the crystal structure of the Al metal in the semi-transmitting reflective film 4 formed on the foundation film 3 so that an increase in the

amount of optical absorption of the Al metal can be prevented. As a result, both the optical transmission performance and the reflection performance of the semi-transmitting reflective film 4 or the semi-transmitting mirror 6 can be improved. See paragraph [0028] of the published specification.

It has been found that in the case that the transmissivity is unchanged, if the thickness of the foundation film 3 exceeds 8 nm, the reflectivity suddenly drops. Paragraph [0041] of the published specification.

Furthermore, the chemical composition ratio x of oxygen (O) to silicon (Si) in the silicon oxide (SiO_x) used as the foundation film 3 is in a range of 1.5 to 2.0. This particular chemical composition ratio also improves the crystal structure of the Al metal in the semi-transmitting reflective film 4 formed on the foundation film 3 so that an increase in the amount of optical absorption of the Al metal can be prevented. As a result, both the optical transmission performance and the reflection performance of the semi-transmitting reflective film 4 or the semi-transmitting mirror 6 can be improved. See paragraph [0029] of the published specification.

It has been found that in the case that the transmissivity is unchanged, if the chemical composition ratio x of oxygen (O) to silicon (Si) in the silicon oxide (SiO_x) used as the foundation film 3 is less than 1.5, the reflectivity suddenly drops. Paragraph [0047] of the published specification.

Descriptive Summary of the Prior Art

Tanaka

Tanaka discloses a liquid crystal panel 100, which comprises (a) a device substrate 200 which is made of an insulating material such as quartz or glass; (b) an insulator film 201 formed on the device substrate 200; and (c) a pixel electrode 234 which is on the insulator film 201 and formed by a reflective metal film having a high reflectivity. Col. 7, lines 20-21, lines 24-29, lines 9-11; Fig. 4. A first metal film 222 is also formed on the insulator film 201. Col. 6, lines 45-51; Fig. 4. The pixel electrode 234 does not overlap with the first metal film 222. See Fig. 4.

The insulator film 201 is used to prevent the first metal film 222 from being removed from the device substrate 200 by heat treatment and to prevent impurities from diffusing in the first metal film 222. If such problems will not occur, the insulator film 201 can be omitted. Col. 7, lines 24-29.

Matsuzaki

Matsuzaki discloses a thin film transistor, which comprises (a) an insulating substrate 1 such as a glass plate or the like; (b) a first electrode 2 acting as a gate electrode; (c) a gate insulating film 3; (d) a thin film pattern 4 mainly composed of silicon and acting as a semiconductor film; and (e) a thin film 10 containing silicon oxide. Col. 2, lines 58-60; col. 6, lines 26-37; Figs. 2A and 2B.

The thin film 10 may contains silicon oxide (SiO_x; $1.5 \leqq x \leqq 2.0$) and phosphorous, and preferably has a thickness of 0.5-10 nm. Col. 5, lines 65-67; col. 7, lines 50-54.

In Matsuzaki, the thin film 10 is used to prevent electrodes 5 and 6, which are formed by a metal film such as an Al film and are on top of the thin film 10, from reacting with the amorphous silicon in the thin film pattern 4. Col. 6, lines 55-66; col. 7, lines 46-54.

Arguments

Claim 1

§102(e) Rejection

Applicants respectfully submit that claim 1, as amended, is not anticipated by Tanaka because Tanaka does not disclose, either expressly or inherently, each and every element as set forth in claim 1.

In particular, Tanaka is silent on the thickness of the insulator film 201. The Examiner concedes that Tanaka does not disclose that the insulator film 201 has a thickness in the range of greater than 0 to 8 nm ("Tanaka fails to teach that the foundation film is made to have a thickness in a range of greater than 0 to 8 nm")(pages 5 and 7 of the Office Action). In contrast, claim 1 recites that the foundation film has a thickness in the range of greater than 0 to 8 nm.

In view of this difference, withdrawal of the §102(e) rejection of claim 1 is respectfully requested.

§103(a) Rejection

Applicants respectfully submit that claim 1, as amended, is patentable over Tanaka in view of Matsuzaki because there is no suggestion or motivation to modify Tanaka with Matsuzaki in the way proposed in the Office Action.

As discussed earlier, in the present invention, the thickness of the foundation film 3 is in a range of greater than 0 to 8 nm in order to improve the crystal structure of the Al metal in the semi-transmitting reflective film 4 formed on the foundation film 3 so that an increase in the amount of optical absorption of the Al metal can be prevented. As a result, both the optical transmission performance and the reflection performance of the semi-transmitting reflective film 4 or the semi-transmitting mirror 6 can be improved. See paragraph [0028] of the published

specification.

Unlike the present application, neither the insulator film 201 in Tanaka nor the thin film 10 in Matsuzaki is used to improve both the optical transmission performance and the reflection performance of a semi-transmitting reflective film.

In particular, in Matsuzaki, the thin film 10 is used to prevent the aluminum electrodes 5 and 6 from reacting with the amorphous silicon in the thin film pattern 4. Col. 7, lines 46-54. In addition, the thin film 10 is not on the insulating substrate 1 directly. Rather, the thin film 10 is on the thin film pattern 4 which in turn is on the insulating film 3. The insulating film 3 in turn is on the insulating substrate 1. See Figs. 2A and 2B.

In Tanaka, the insulator film 201 is used to prevent the first metal film 222 from being removed from the device substrate 200 by heat treatment and to prevent impurities from diffusing in the first metal film 222. If such problems will not occur, the insulator film 201 can be omitted. Col. 7, lines 24-29. In Tanaka, reaction between the pixel electrode 234 or the first metal film 222 and the device substrate 200 is not an issue.

In view of the differences in the problems being solved by Tanaka and Matsuzaki, a person with ordinary skill in the art would not modify the thickness of the insulator film 201 in Tanaka to the range of greater than 0 to 8 nm in view of the 0.5 to 10 nm thickness of the thin film 10 in Matsuzaki in an attempt to improve both the optical transmission performance and the reflection performance of the pixel electrode 234. This is especially true when the optical reflectivity of the pixel electrode 234 would suddenly drop if the thickness of the insulator film 201 in Tanaka exceeds 8 nm, and when Tanaka suggests eliminating the insulator film 201 completely if the removal or impurity problem does not occur. Therefore, there is no suggestion or motivation to modify Tanaka with Matsuzaki in the way proposed in the Office Action.

The fact that something can be done is an insufficient basis to obviate an invention. Absent a motivation, the references can be combined in the way proposed in the Office Action only with impermissible hindsight based on the present invention.

Recognition of the problem being solved is important when considering the issue of obviousness under 35 U.S.C. §103. There is a line of CAFC cases dealing with the relevance of the problem being solved in determining obviousness. In re Dillon, 892 F.2d 1554 (Fed. Cir. 1989). In re Wright, 848 F.2d 1216 (Fed. Cir. 1988) states the following:

> "The determination of whether a novel structure is or is not 'obvious' requires cognizance of the properties of that structure and the problem which it solves, viewed in light of the teachings of the prior art." (emphasis added).

It is respectfully submitted that if this aspect of the case law is considered, one has to conclude that claim 1 is patentable over the applied references.

Withdrawal of the §103 rejection of claim 1 is therefore respectfully requested.

Claims 2-5

Claims 2-5 depend, either directly or indirectly, from claim 1 and, thus, each is allowable therewith.

In addition, claims 2-5 include features which serve to even more clearly distinguish the present invention over the prior art of record.

Claim 6

Claim 6 is not anticipated by Tanaka for at least the same reasons claim 1 is not anticipated by Tanaka. In addition, the Examiner conceded that Tanaka fails to disclose that the foundation film is made of silicon oxide, or that the foundation film has a chemical composition ratio x of oxygen (O) to silicon (Si) in the silicon oxide (SiO_x) in a range of 1.5 to 2.0, as recited in claim 6 (pages 5 and 8 of the Office Action).

In view of these differences, withdrawal of the §102(e) rejection of claim 6 is respectfully requested.

Moreover, claim 6 is patentable over Tanaka in view of Matsuzaki for at least the same reasons that claim 1 is patentable over Tanaka in view of Matsuzaki. In addition, the same reasons why there is no suggestion or motivation to modify Tanaka with Matsuzaki with respect to the foundation film thickness limitation are also applicable to the limitation that the foundation film has a chemical composition ratio x of oxygen (O) to silicon (Si) in the silicon oxide (SiO_x) in a range of 1.5 to 2.0.

In view of the foregoing, withdrawal of the §103(a) rejection of claim 6 is respectfully requested.

Claim 7

Claim 7 depends from claim 6 and, thus, it is allowable therewith.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application; however, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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